Effect of Art Integration in Mathematics Teaching on Achievement Motivation, Creative Thinking and Academic Achievement of Middle Stage Students

Synopsis

Submitted in the partial fulfilment for the requirement of

Doctor of Philosophy

in

EDUCATION

Submitted by

ADITI SHARMA

Dr. T. K. Rao

Co-Supervisor
Assistant Professor

Prof. A.K. Kulshrestha

Supervisor

Department of Pedagogical Sciences, Faculty of Education
Dayalbagh Educational Institute (Deemed to be University)
Dayalbagh, Agra – 282005

2024

1.0.0 INTRODUCTION

"The way to development is through purposeful activity. The young especially have to be guided properly, so that their lives find a proper direction and their creativity is allowed to flower".

Dr. A.P.J. Abdul Kalam

Education is a key instrument that helps in the acquisition of knowledge, skills, and attitudes and helps in the all-around development of the personality. Learning is a well-defined, systematic process for attaining the desired goals and objectives. The entire pedagogical process should be triggered in the appropriate direction to achieve the desired results. Mathematics has played a vital role in building our civilization; without mathematics, we can't imagine the development of our nation. Mathematics and society are strongly interlinked with each other. Most of the mathematics teaching sessions are done in a monotonous way where the teacher plays an active role and students are passive listeners. The incorporation of art-integrated learning activities in mathematics education may serve as a tool for the development of creativity, analytical thinking, and critical thinking skills among students.

The arts play an important part in our lives, and their significance has always been felt across the world. The arts are an effective method through which individuals can better express their emotions and share their feelings, thoughts, and ideas in front of others. The Encyclopaedia of Art defines art as "the use of skill and imagination in the creation of aesthetic objects and environments that can be shared with others" (Rao, Kumar, & Kumar, 2017, p. 3). The arts support the emotional, intellectual, aesthetic, creative, social, and spiritual enhancement of individuals by leading to their holistic growth and progress. According to Fiske (1999), when children are exposed to the arts, they are presented with "authentic learning experiences that engage their brains, hearts, and bodies" (Lloyd, 2017, p. 9). The arts also benefit students by providing an active learning atmosphere to develop creative experiences. Students get new experiences when participating in the arts, which ultimately assist in improving their learning.

Art and mathematics are closely linked through several concepts. Most importantly, both of these disciplines play an important role in understanding patterns as well as enhancing spatial abilities and visualisation. Integrating art with mathematics would need to include not only art activities that engage students in creating visual patterns, but also exposure to examples of art works that contain interesting

patterns. Students need to understand the deeper connections between these two disciplines. Students discover creative means of solving difficult problems and exchanging ideas through artistic involvement to find solutions to specific issues. Involvement in the arts provides both students and teachers with a lot of experience by promoting experiential learning and setting an environment for active learning amongst the learners. Thus, we can see how important the arts are in our lives and how significant it is to include them in the curriculum for students and teachers to both receive the maximum benefits from them.

1.1.0 ART INTEGRATION

Art Integration is a method of teaching through and with the arts that establishes connections between various art forms and other subjects (Burnaford et al., as cited in Maneen, 2016).

Art Integration is a NCERT initiative based on the recommendation of NCF-2005, "Education through the arts, where learning takes place using different art forms as tools in the teaching and learning process". The Art Integration Model is intended to encourage experiential learning, in which each learner is given the opportunity to engage in art experiences (both visual and performing arts) in order to better understand and study different topics. Arts-based learning experiences are crucial in fostering students' critical thinking, creativity, imagination, and innovative skills. These abilities are increasingly acknowledged as basic talents and competencies that all students require as part of schooling that integrates arts-based learning.

Numerous studies in the fields of education and psychology have demonstrated the wonders that may be accomplished through the use of the arts in education and learning. As a result, a strong desire exists to incorporate the arts into school curricula and teaching methods. "Art can be the spark that engages students and draws them into learning." (Burnaford et al., as cited in Ross 2008 p.8). Art Integration is an incorporation of different Art forms such as Performing and Visual Arts in core curricula for better understanding of concepts. It also helps in increasing relevance by integration of art forms and subject matter. It helps in exposing students to different art forms that lead to stimulate all senses and gain deeper understanding of concepts. Art Integrated Learning helps in developing a greater sense of motivation among students and act as a tool to help in better understanding of concepts. (Anderson ,2013). A document released by the Central Board of Secondary Education (2019) defines art integration

as a cross-cultural approach to teaching and learning in which the teaching subject and art form work together in collaboration. In it, different art forms become the pathway for teaching and assessing a particular subject or topic. The preamble of the 'Seoul Agenda (2010)' highlights the importance of integrating Arts in teaching and learning by stating that- "*…arts education has an important role to play in the constructive transformation of educational systems that are struggling to meet the needs of learners in a rapidly changing world, characterised by remarkable advances in technology on the one hand, and intractable social and cultural injustices on the other." (as cited in NCERT Guidelines on AIL, 2019).*

The NEP 2020 states on page 12 (para. 4.7) that:

"Art integration is a cross-curricular pedagogical approach that utilises various aspects and forms of art and culture as the basis for learning concepts across subjects. As a part of the thrust on experiential learning, art-integrated education will be embedded in classroom transactions not only for creating joyful classrooms but also for imbibing the Indian ethos through the integration of Indian art and culture in the teaching and learning process at every level. This art-integrated approach will strengthen the linkages between education and culture."

Ross (2008) views that when art is incorporated into the curriculum, it may help students discover connections between different disciplines and develop deeper knowledge across the board. Arts may be employed to encourage participation of all learning types while also providing interesting components in classes that provide pupils with freedom of expression. This teaching-learning model supports flexibility in providing instructions, evaluation, assessment, motivation, and feedback strategies. Ross (2008) throws light on the importance of arts integration by stating that with arts integration, learning is tied to the actual real world. This approach to teaching stresses in-depth information, relevant concepts, and links between many courses and aspects of students' daily lives outside of school.

Art Integration in Nurturing Inclusivity in Classroom Gardner (1990) stated, "Individuals do not develop simply by existing, or growing older, or turning into larger; they must undergo certain pivotal experiences that lead to periodic reorganizations of their knowledge and understanding" (p. 3).

…when students are themselves engaged in rich and engaging projects, which call upon a variety of modes of representation; when they have the opportunity to interact and communicate with individuals

these are the settings that allow for proper alignment of the various kinds of information by those who demonstrate complimentary types of learning. (p. 31- 32) Gardner (1994) also wrote, “Because the arts give a natural means for men to act and to speak, they can reveal important and elusive knowledge regarding the experiences and subjective life of others” (p. 349). Additionally, there is no right or wrong path to participate in the arts, and because of this, every individual is equally able to contribute to the production of the arts. For example, when integrated into the syllabus, dance and movement permit students to use their minds and bodies, and change them to creatively communicate their thoughts, ideas, and contributions to a lesson; the visual arts help to engage students' problem solving and critical thinking skills, aid in fine motor development, and, along with dance, can help promote prosocial behaviours when working cooperatively; and music is a way to help students maintain a calm and relaxed state, become engrossed and focused on the task at hand, and create an enjoyable atmosphere. The arts enable all students to participate in and contribute to a lesson, promote creative skills and abilities, and allow educators to see how every student can contribute to the activity. Furthermore, the arts support learning in numerous ways. The arts are primarily classified into two types: visual and performing arts. These both further include different art forms, as shown in the following.

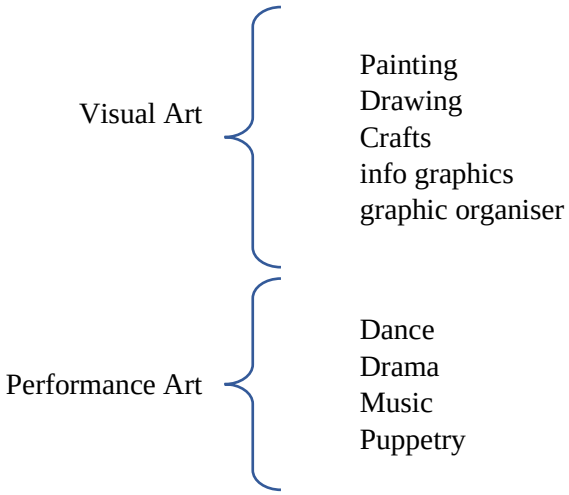

Figure 1 Showing the Two Different Forms of Art

Art-Integrated Learning is not just about teaching art for art’s sake; it’s about using art as a tool to enhance overall education, enrich experiences, and prepare students for the complexities of the modern world. It nurtures creativity, critical thinking, and empathy, essential skills in the 21st century. Everyone

has an inner urge to show that it is not ordinary and aspires to reach higher.

1.2.0 NCERT Guidelines of Art integration for Upper Primary

During this stage, children are ready to comprehend more complex interconnections between concepts and the environment. AIL can allow children to build on simple concepts as well as relate them to academic content meaningfully. Children also enhance the skill of working in groups and exploring ideas together. The objectives of AIL at the upper primary level are to help children:

- Explore multiple perspectives on concepts
- Construct knowledge of themes, subjects, and concepts and be aware of the interdisciplinary connections.
- Develop a pluralistic approach and appreciate different possibilities.
- Promote teamwork and mutual appreciation.
- Enhance communication skills, language skills, and problem-solving skills.
- Build sensitivity towards environmental and societal concerns
- Create art and apply their artistic skills to their day-to-day activities.
- Learn inclusive practices of respect, care, empathy, and compassion.
- Foster socio-emotional competencies and cognitive competence
- Understand and regulate their emotions.
- Create awareness of rich heritage and cultural diversity.

1.3.0 Art Integration in The Field of Mathematics Education

Art Integration in mathematics Education; act as an interdisciplinary approach of teaching in which students explore and investigate critically and develop creative thinking for deeper understanding of the topics related to mathematics Education. Art Integration encourages expression through different art forms such as Visual and Performing Arts which fosters imagination, creativity and innovation among students. Integration of different art forms in commerce education will help in achieving the objectives.

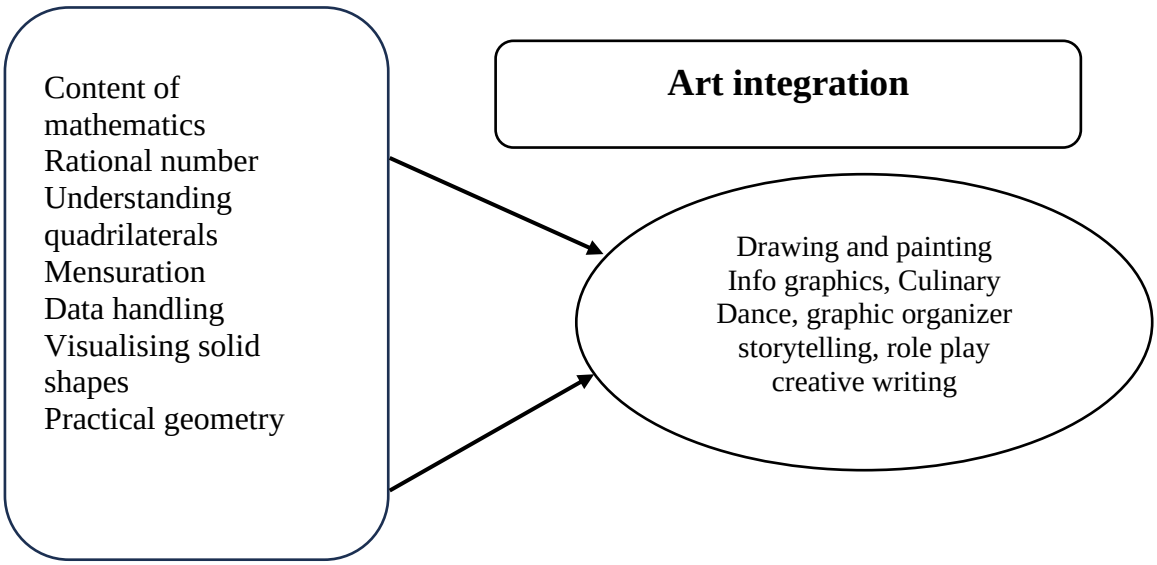

Figure 2 Art Integrated learning Activities in the field of mathematics

Fig. 2 illustrates the use of different Art Integrated Activities that will be used in the teaching of mathematics content for the development of creative thinking, achievement motivation and academic achievement. For Example: Researcher will use different Art Integrated Activities such as Drawing and painting, Role Play, Creative Writing, Graphic Organizer, Infographics, dance, storytelling culinary etc. These activities can be used for teaching different concepts of mathematics such as Rational number, understanding quadrilateral, linear equation in one variable, mensuration, data handling, visualising solid shapes and practical geometry. which will help in strengthening knowledge and to develop future-ready learners, who will be able to apply their theoretical knowledge in their real-life settings.

1.4.0 ACADEMIC ACHIEVEMENT

Academic achievement is an extreme goal of education. It develops skills in a particular subject or subjects. Students enhance their skills in learning subjects and give their best to gain academic scores. It is a short-term goal for students and teachers. It provides potential and confidence for the student to achieve their goals. There is no standardised tool to measure academic achievement. It can only be measured by institutional examinations and continuous assessments, but in the current scenario, academic achievement is not able to fulfil the goals of skill development and knowledge retention because students focus on rote learning. They usually forget the subject learned after their examinations, as they learn it superficially using rote memory.

Academic achievement can be the most important factor in determining the genuine potential and talents of children. As an indicator of a child's future, their academic success in school puts a lot of strain on both parents and children's minds. This academic success is the consequence of a variety of elements, including personal, social, economic, and other environmental circumstances, and it depends on both cognitive and non-cognitive parts of the personality. A child's academic progress may be enhanced by a positive and encouraging atmosphere in the home, school, and neighbourhood.

1.5.0 CREATIVE THINKING

Creative thinking is the ability to create or invent new things, concepts, ideas, solutions, etc. It is an essential skill of the present century that can transform an imaginary world into a real one. Everyone has the skill of creative thinking in their specific area. It is a unique way to solve new problems. Creative thinking includes visual arts, writing skills, problem-solving ability, and perceptions of different views. It is a gateway to a new era and an important part of our daily lives because we face different types of situations every day; creative thinking provides a different perception of how to deal with our situation. It enhances our knowledge for developing something new or recreating an old concept in a new manner. The outcome of creative thinking is always fruitful because it leads to new innovation. In school, many students don't recognise their capacity for creative thinking because during this time they focus only on their studies and academic achievements, but these achievements are temporary because they do not have any practical knowledge.

Creative thinking is not the only key to achieving the goals of students but also a path to enhance the academic achievement and curiosity of the student. Academic achievements, creative thinking, and achievement motivation of the student are the essential elements of effective education, which provide an excellent way to live a successful life.

Mednik (1964) said that "Creative Thinking consists of the forming of new combinations of associative elements into new combinations which either meet specific requirements or are in some way useful. The more mutually remote the elements of the new combination, the more creative the process or solution"

Torrance (1979) defined Creative Thinking as "The process of sensing gaps or disturbing or missing elements, forming ideas or hypotheses and communicating the results, possibly modifying and retesting the hypothesis."

1.6.0 ACHIEVEMENT MOTIVATION

Achievement motivation as the drive to work with diligence and vitality, to constantly steer toward targets, to obtain dominance in challenging and difficult tasks and create sense of achievement as a result (Biegge and Hunt, 1980). As expressed by Biegge and Hunt, achievement motivation consists of three elements: the stimulation of personal capabilities, constant efforts with drive and obtaining of sense of satisfaction. It is concerned with predicting behaviour and that is possible only when information about motivational and psychological factor is taken into consideration. It aids in bringing about the ideal motivation as well as emotional development in the children.

Achievement motivation is based on attaining success and achieving all of our aspirations and objectives in life. Achievement goals can show its impact on the way a person performs a task and represent a desire to show proficiency and competence (Harackiewicz, Barron, Carter, Lehto, & Elliot, 1997). These fundamental physiological motivational drives affect our natural behaviour in different environments. Our motives for achievement can vary from biological needs to satisfying creative desires or realizing success in competitive ventures.

Achievement motivation is a sense of connection to the effort required to reach a given standard of internal excellence and describes a person's actions when they make an effort to complete a task or perform better than others. It is a recognized strategy for achieving goals and battling for success. The will to succeed depends upon experiences in early stages of life. Today's modern society expects everyone to be successful in their life.

1.7.0 Factors Involved in Achievement Motivation

Covington (1998) noted several factors of motivation, which are as follows:

- **Levels of Aspiration:** Judgements of success or failure depend less on actual levels of performance and more on the relationship between the individual's performances and aspirations. Feelings of success come when goals are achieved. Feelings of failure come when they are not.
- **Self-Confidence:** Self-confidence reflects the extent to which individuals believe themselves able enough mentally to win the prize, strong enough to turn back the foe, or possessing sufficient hand-eye coordination to toss enough rings correctly.
- **Expectancy:** The term expectancy generally refers to perceived estimates of eventual success—

how sure individuals are of doing well in the end, but not necessarily that they themselves are the cause of their success.

- **Realistic Challenges:** The key to sustained involvement in learning requires that a realistic match be established between the individual's present capabilities and the demands of the achievement task.
- **Self-Generated Goals:** The subjects set their own achievement goals and altered them as necessary. The result was that their aspirations spiralled upward just ahead of current achievement levels, but not so far ahead that their temporary goals could not be reached and surpassed through persistent effort and practice. In this manner, they were constantly performing at their current maximum.
- **Control of One's Own Progress:** The feeling of control over one's own progress that came by way of setting one's own goals generated a positive dynamic that sustained involvement in the task.

Thus, achievement motivation is believed to be learned during socialisation processes and learning experiences. Those with high achievement as their morals in their early life experiences would develop a high need to achieve, while those who have low achievers as their models hardly develop the need to achieve, while those who have low achievers as their models hardly develop the need to achieve.

Enhancing the motivation of students with different methods has become a very important area for the researcher. Art-Integrated Learning will provide an open learning environment with opportunities for students to explore and construct meaningful knowledge. It can also build up students 'abilities to learn mathematics beyond the textbook. Thus, it is very important to investigate how students' achievement motivation is affected by art-integrated learning.

2.0.0 EMERGENCE AND JUSTIFICATION OF THE STUDY

Education plays an important role in the development of any nation. Since the beginning of time, rote learning has been a terrible thing in Indian classrooms. With the revolution of globalization, there is a glimmer of hope that education will be rescued from the clutches of rote learning. Thus, there is an urgent need to move away from rote learning in order to truly practice student-centric, activity-based learning and experiential learning in the field of mathematics. With the aim of discouraging rote learning, CBSE (2019) recommends that art be integrated with the teaching and learning process to promote active and experiential learning for "connective knowledge to life outside the school, ensuring

the learning shifts away from rote methods, and enriching the curriculum so that it goes beyond textbooks.” In comparison to traditional teaching methods, Students who received Art Integrated Lessons improved their capacity to judge their learning & reported that Art Integrated Learning enhanced the intrinsic motivation and promote learning for better understanding (Morris,2002).

CBSE (2019) recommends “Art Integrated Learning provides a path to all the stakeholders in school education for Art Integrated Learning as pedagogy and its innate relevance to the education system. Learners explore creatively while building connections between different concepts through various art forms. Art experiences, both in the visual (drawing and painting, clay modelling, pottery, paper crafts, mask and puppet making, heritage crafts, etc.) and performing arts (music, dance, theatre, puppetry, etc.), lead to a better understanding and construction of knowledge about different concepts. The arts have the flexibility to accommodate age-appropriate opportunities for learners who can explore these things at their individual pace. This resonates with the experiential learning approach." Art-based instruction is better than conventional instruction because it helps enhance long-term memory for science students (Mariale M. Hardimana, 2019). Result of achievement surveys like National Achievement Survey (NAS), various State Level Achievement Survey (SLAS) conducted by stated, exams like Program for International Student Assessment (PISA) etc. and a general debate in the country for better quality of education have become the catalysts in bringing about the much-needed movement towards the Experiential learning pedagogy, with a focus on hands-on experience, art integration through real-life situations, to raise the competence level of the Indian students (CBSE Manual, 2019, p.10).

According to the NAEP Survey report (2022), average mathematics scores in the nation were lower by 8 points in eighth grade compared to scores in 2019.

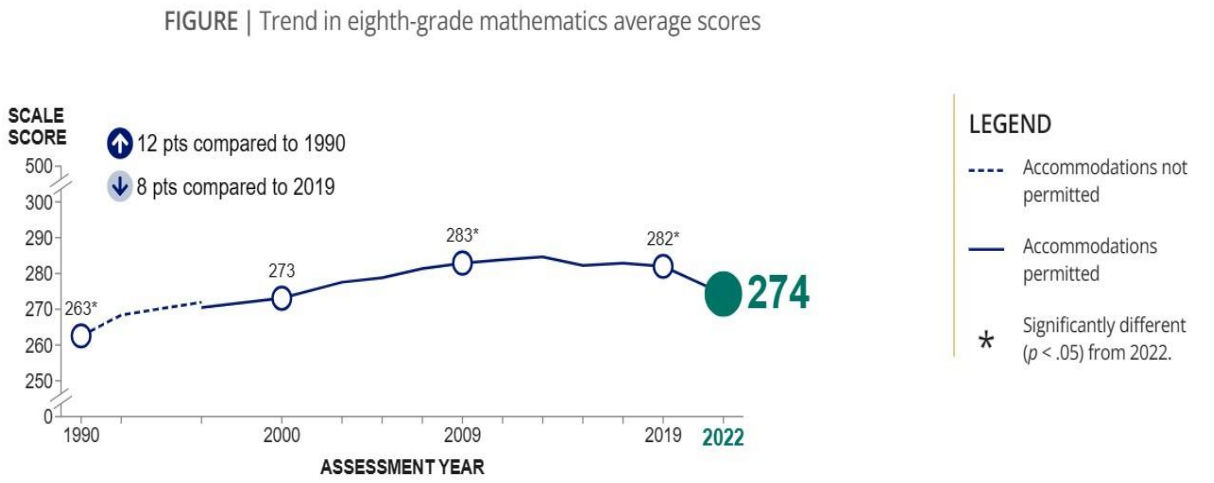

Figure 3 Trends in eighth grade mathematics average scores (Source: https://www.nationsreportcard.gov/mathematics/?grade=8)

Roy (2015), in her study, revealed that achievement motivation is positively related to academic achievement, and the majority of the students possessed average achievement motivation, while low and very high achievement motivation were possessed by a minority of the students. Gender and locality of the students do not influence their achievement motivation. The study suggests that with proper tutoring and guidance, achievement motivation can be improved, and that can be channelled towards improving the academic achievement of the students. Kumar & Bajpai (2015), in their study, found that the relationship between achievement motivation and academic performance was significant. Achievement motivation is the motivation produced by this desire for success.

The present study will be helpful in understanding the effect of art-integration in mathematics teaching on achievement motivation, creative thinking, and academic achievement among the students. It will help teachers, school authorities, administrators, curriculum planners, counsellors, and guidance workers plan curriculum and other activities in the school in such a way that it increases achievement motivation among students. Also, remedial measures can be adopted for students who need them so that they can compete with other students and reach their goals without any obstacles.

Suskin, K. (2013), in their study, found that a holistic way of arts integration helps transform schools into learning communities for a better chance of learning. Susan H. (2014) found in their study that creativity evolved throughout the collaboration, and students work in new modes of communication in order to bridge cultures through the use of art integration. Randolph, D. (2016) found that arts integration

has the potential to build relational and social self-efficacy. Hardiman (2017) found in their study that strong co-relational evidence suggests involvement in the arts improves students' memory of learning events. According to NEP 2020, mathematical abilities should be integrated and improved with the use of art integrated learning. As NEP 2020 focuses on integrating creative thinking to boost the capacity to learn mathematics in students.

Table 1 Researches related to Art Integration, Achievement Motivation, Creative Thinking and Academic achievement

Researcher	Year	Topic	Result
Githua, B.N., & Njubi, J.N.,	2013	Effects of Practicing Mathematical Creativity Enhancing Learning / Teaching Strategy During Instruction on Secondary School Students‟ Mathematics Achievement by Gender in Kenya‟s Nakuru Municipality	MCETS is an effective teaching/learning strategy which Mathematics teachers need to incorporate in their teaching
Sikhwari, T.D	2014	Relationship between Motivation Self-Concept and Academic Achievement of Students at a University of Limpopo Province, South Africa.	A significant correlation was found between Academic Achievement and motivation.
Krakur, L	2017	Arts Integration for understanding: Deepening Teacher practice in and through the Arts	Teaching through the arts can support learners in constructing, communicating and having a deeper understanding of the concepts.
Hasan, M & Sarkar, R	2018	Achievement Motivation and Academic Achievement of the Secondary Level Students in Uttar Dinajpur District	Study indicates the non-significant relationship between Achievement Motivation and Academic Achievement of the secondary level students of Uttar Dinajpur District.
Anwar, M.A & Khizar, A	2020	Relationship of Creative Thinking with the Academic Achievements of Secondary School Students	Results revealed a statistically significant relationship between creative thinking and academic achievements of secondary school students.
Niranjana K. P. & Arjun R. S.	2021	Effectiveness of Art Integrated Strategy on Achievement in Mathematics among Secondary school students	The findings of the study revealed that Art integrated strategy cannot be declared as strategy which is effective than constructivist strategy on Achievement in Mathematics among secondary school students even though it can be used for Mathematics transactions.
Pattanayak, N &	2023	The relationship between	Finding of the study revealed

Singh, J. P		achievement motivation and Creativity among secondary school students.	that achievement motivation is a non-significant variable of creativity.
Das, D	2023	Achievement Motivation Influencing Academic Achievement of Secondary School Students in Relation to Variations in Gender and School Interventions	Finding of the study reveal that no significant effect of achievement motivation and academic achievement in relation to gender variation and school intervention.
Kaur, K	2023	Effect of sheltered instruction observation protocol model of teaching on achievement language creativity and achievement motivation among elementary students	The results of the study show no significant interaction effect of the instructional strategies on gender and type of school on the Achievement Motivation of the students.

After going through the literature review of the areas selected, it is found that currently there is a deficit in literature related to Art Integration in the field of mathematics. Few national & international studies have been done on Art Integration in areas such as Hindi, English, Science and Islamic Studies. This study will cover the impact of art integrated learning on middle-stage pupils' achievement motivation, creative thinking and academic achievement. These factors are all crucial for the operation of the educational system and will be the basis for improving the level of art integrated learning tactics, which will also increase the learning capacity of middle-stage students.

After undergoing the process of reviewing the research, the following questions were kept in the mind of the researcher in the context of Art Integration.

RESEARCH QUESTIONS:

1. What is the effect of art integration in mathematics teaching on achievement motivation of middle-stage students?

2. What is the effect of art integration in mathematics teaching on creative thinking of middle-Stage Students?

3. What is the effect of art integration in mathematics teaching on academic achievement of middle-Stage Students?

3.0.0 STATEMENT OF THE PROBLEM:

Effect of Art Integration in Mathematics Teaching on Achievement Motivation, Creative Thinking and Academic Achievement of Middle Stage Students.

4.0.0 DEFINITIONS OF THE TERMS USED IN STUDY;

4.1.0 ART INTEGRATION

Art Integration is "An approach to teaching in which students construct and demonstrate understanding through an art form. Students engage in a creative process which connects an art form and another subject and meets evolving objectives in both."

-Lynne B. Silverstein and Sean Layne (2010)

OPERATIONAL DEFINITION

In the present study, Art Integration refers to a methodology where different art forms are used as a medium of teaching; a key to understanding concepts of mathematics with integration of different Art Integrated Activities. These Activities will consist of Role Playing, Drawing and painting, Dance, Creative Writing, Graphic Organizers & Infographics.

4.1.1 CREATIVE THINKING

Creative Thinking is the capacity to generate many different kinds of ideas, manipulate ideas in unusual ways and make unconventional connections in order to find novel possibilities that have the potential to elegantly meet a given purpose. **-D. Ramalingam (ASER Report -2020)**

OPERATIONAL DEFINITIONS

Creative Thinking is the ability of fluency, flexibility and originality of new discovery and innovative ideas to achieve the academic goals through art integration. The effect on creative thinking will be measured by comparing the post-test scores of the experimental and control groups.

4.1.2 ACHIEVEMENT MOTIVATION

Achievement motivation is the need for excellence and significant accomplishment, despite what rewards may be offered after the achievement has been met**.** **-David McClelland (1961)**

OPERATIONAL DEFINITION

In the present study, Achievement motivation refers to performing well in relation to a standard of excellence taught by art integration or in comparison with others who are competitors. The effect on achievement motivation will be measured by comparing the post-test scores of the experimental and control groups.

4.1.3 ACADEMIC ACHIEVEMENT

"Academic Achievement refers to what the students have learned or what skills the student has learned and it usually measured through assessment like standardized tests, performance assessments and portfolio assessment **-Santrock (2006)**

OPERATIONAL DEFINITION-

Academic Achievement is the performance of students in mathematics taught by art integrated learning measured by the score of the Academic Achievement test. The effect on academic achievement will be measured by comparing the post-test scores of the experimental and control groups.

4.1.4 MIDDLE-STAGE STUDENTS

Middle-stage students were stated or used as students who enrolled in middle-stage period 6 to 8 grade according to NEP 2020.

OPERATIONAL DEFINITION

In this study, 8th grade students will be used for the experimental and controlled groups.

5.0.0 OBJECTIVES OF THE STUDY

The objectives of the present study are as follows:

1. To develop lesson plan using art integration method in mathematics for class VIIITH students.
2. To assess the effect of art integration in mathematics teaching on achievement motivation of middle stage students.
3. To assess the effect of art integration in mathematics teaching on creative thinking of middle stage students.
4. To assess the effect of art integration in mathematics teaching on academic achievement of middle stage students.

6.0.0 HYPOTHESES OF THE STUDY

The hypotheses of the present study are as follows:

1. H_{a1}: There will be a significant effect of art integration in mathematics teaching on achievement motivation of middle stage students
2. H_{a2}: There will be a significant effect of art integration in mathematics teaching on creative thinking of middle stage students.
3. $H_{a3:}$ there will be a significant effect of art integration in mathematics teaching on academic

achievement of middle stage students.

7.0.0 DELIMITATIONS OF THE STUDY

The study will be delimited in the following ways:

1. The Study will be delimited to Agra city only.

2. The Study will be delimited to VIII Class students only.

3. The study will be delimited to CBSE Schools only.

8.0.0 VARIABLES OF THE STUDY

The variables related to present study are depicted as follows:

- Independent Variable: Teaching method- Art Integrated Method and Conventional Method
- Dependent Variables: Achievement Motivation, Creative Thinking and Academic Achievement
- Controlled Variables: Age, Grade, Board

9.0.0 RESEARCH METHODOLOGY

Quasi Experimental Research Method will be used in the present study and the Two group Non-equivalent pretest post-test design will be used in the present study.

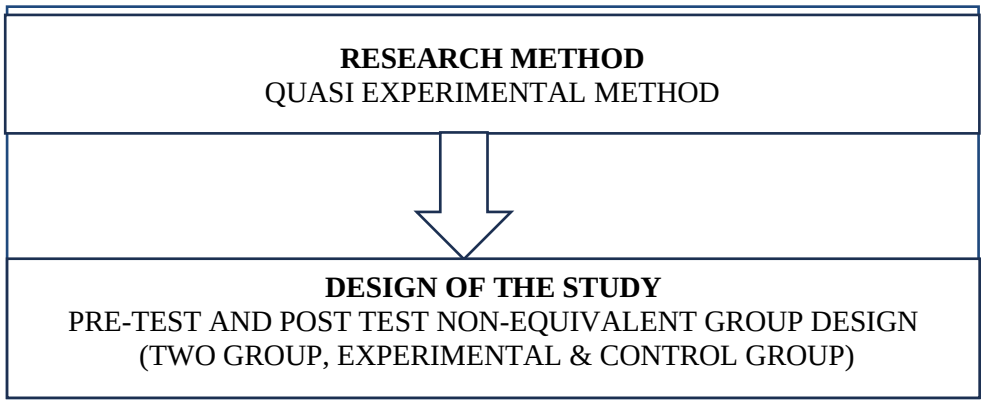
RESEARCH METHOD
QUASI EXPERIMENTAL METHOD
DESIGN OF THE STUDY
PRE-TEST AND POST TEST NON-EQUIVALENT GROUP DESIGN
(TWO GROUP, EXPERIMENTAL & CONTROL GROUP)

Figure 4 Research Methodology

10.0.0 RESEARCH DESIGN:

The design of the experiment will be of two groups Pretest Post-test design which will be conducted in three phases:

1. Planning Phase – It will include content analysis of mathematics and development of lesson plans using art integration based Instructional strategies.

2. Experimentation Phase – The researcher will conduct pretest to assesses a student's strengths, weakness, knowledge and skills prior to instruction. After pretest execute art integration based Instructional Strategies by using lesson plans on experimental group and conventional method of teaching on control group.

3. Evaluation Phase - After completion of experimentation phase, researchers will conduct post-test of experimental and control groups.

Table 2 Research Design

<table>
<tr><td colspan="5">PHASE-I PLANNING</td></tr>
<tr><td colspan="5">Content analysis of mathematics text book</td></tr>
<tr><td colspan="5">Framework of Lessons to be taught by art integrated based Instructional Strategies</td></tr>
<tr><td colspan="5">Steps to Develop Lesson Plans to Use Art Integration based Instructional Strategies</td></tr>
<tr><td colspan="2"></td><td colspan="2">PHASE-II EXPERIMENTATION</td><td>PHASE-III EVALUATION</td></tr>
<tr><td>Research method</td><td>Groups</td><td>Pre-test</td><td>Intervention</td><td>Post-test</td></tr>
<tr><td rowspan="2">Quasi-experimental method</td><td>Experimental group (randomly assigning 40 students)</td><td>Pre-test for achievement motivation, creative thinking, and academic achievement</td><td>Teaching mathematics: 30-lesson plan using art integration</td><td>Post test for achievement motivation, creative thinking, and academic achievement</td></tr>
<tr><td>Control group (randomly assign 40 students)</td><td>Pre-test for achievement motivation, creative thinking, and academic achievement</td><td>Teaching mathematics: 30-lesson plan using traditional method</td><td>Post test for achievement motivation, creative thinking, and academic achievement</td></tr>
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10.2.0 Steps to Develop Lesson Plans to Use Art Integration based Instructional Strategies:

The researcher will use Art integration based Instructional Strategies through lesson plans. The steps are as follows

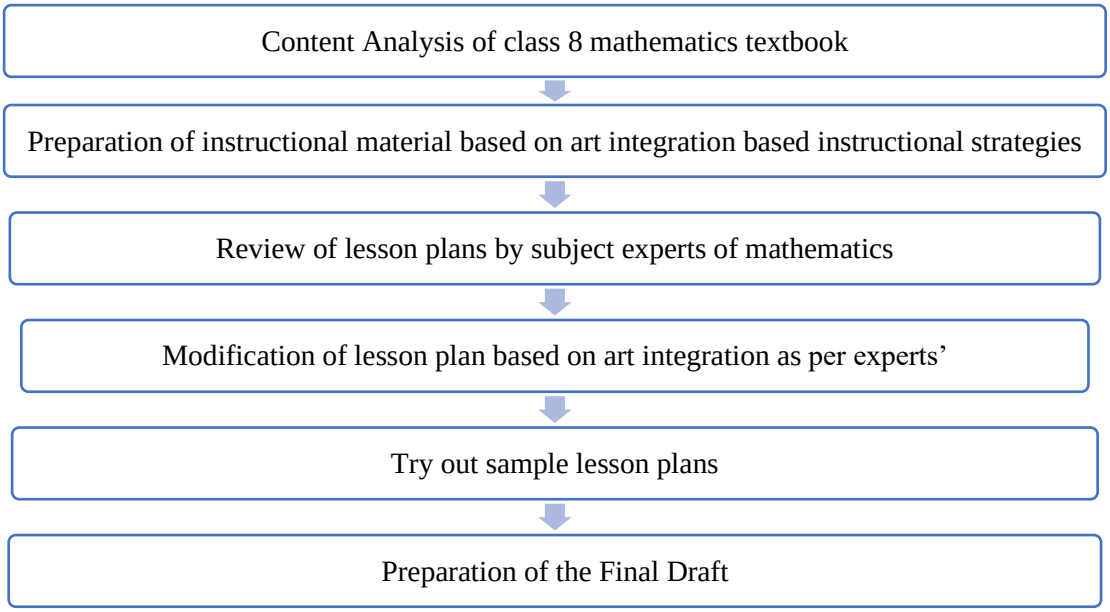
Content Analysis of class 8 mathematics textbook
Preparation of instructional material based on art integration based instructional strategies
Review of lesson plans by subject experts of mathematics
Modification of lesson plan based on art integration as per experts'
Try out sample lesson plans
Preparation of the Final Draft

Figure 5 Steps for developing Lesson Plans using art integration based Instructional Strategies

Table 3 Framework of Lessons to be taught by art integrated based Instructional Strategies

Chapter Name	**Teaching point**	**Art integration based Instructional Strategies**
Understanding Quadrilaterals	• polygons • Kinds of quadrilaterals • parallelogram • Special parallelograms	Painting, drawing Infographics, Culinary Dance Story telling Role play Graphic organizer Creative writing
Rational number	• Properties of rational numbers	
Mensuration	• Area of polygon • Solid shapes • Surface area of cube, cuboid and cylinder • Volume of cube, cuboid and cylinder	
Visualising solid shapes	• 2 D and 3 D Shapes • Faces, Edges and Vertices	
Practical geometry	• Constructing a Quadrilateral	
Data handling	• Pictograph, bar graph • Pie chart • probability	

11.0.0 POPULATION AND SAMPLE TECHNIQUE

In this study, Multi-Level Mixed Method Sampling will be used by the researcher. Mixed Method Sampling involves combining probability and non-probability sampling techniques in creative ways to answer research questions. (Teddlie, C.2007). Population of the Study will be VIII Grade Students of CBSE School from Agra City, 80 Students of VIII class will be selected as sample of the present study. In the First Phase, Purposive Sampling will be used for school & class selection from Agra City, Random Sampling will be used for the selection of the section which will be a collective representation of the sample. Intact Sampling will be used for assigning the Sections as Experimental and Control group. (Intact Group) As the Sampling Process is well defined and will be able to select proper representative of the sample from the population therefore this sampling design will ensure the accuracy of estimates in the study.

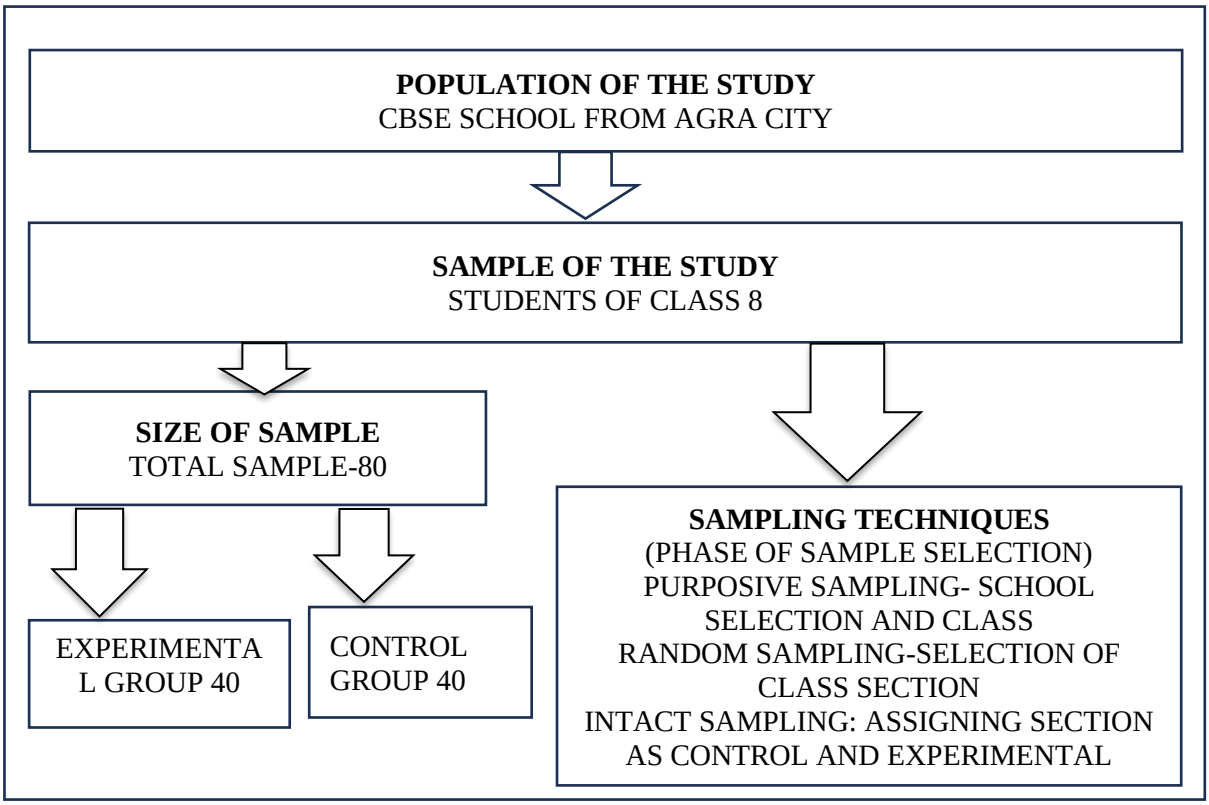
POPULATION OF THE STUDY
CBSE SCHOOL FROM AGRA CITY
SAMPLE OF THE STUDY
STUDENTS OF CLASS 8
SIZE OF SAMPLE
TOTAL SAMPLE-80
EXPERIMENTAL GROUP 40
CONTROL GROUP 40
SAMPLING TECHNIQUES
(PHASE OF SAMPLE SELECTION)
PURPOSIVE SAMPLING- SCHOOL SELECTION AND CLASS
RANDOM SAMPLING-SELECTION OF CLASS SECTION
INTACT SAMPLING: ASSIGNING SECTION AS CONTROL AND EXPERIMENTAL

Figure 6 Population & Sample of the Study

TOOLS OF THE STUDY

12.0.0 Tool of the study:

30 Lesson Plans will be prepared by the researcher in the Art Integration Method. Every Lesson Plan

will be planned from the CBSE Board Curriculum prescribed for Class VIII.

Self-Constructed will be used in the present Study:

- Achievement test

12.1.0 Survey and selection of tool for Creative Thinking

Table 4 Survey Tool for Creative Thinking

NAME OF THE TEST	AUTHOR	YEAR	STATUS	REASON
Verbal Test of Creative Thinking	Baqer Mehdi	2019 (Revised)	SELECTED	It fulfils all the dimension of this study
Non-Verbal Test of Creative Thinking	Baqer Mehdi	2015(revised)	REJECTED	It is not suitable for this study
Passi Creativity Test	B.K Passi	1972	REJECTED	This is not applicable for middle stage students.
DIVERGENT PRODUCTION ABILITIES	K.N Sharma	2006	REJECTED	This test assess not only creativity but all divergent abilities

12.2.0 Survey and selection of tool for Achievement Motivation

Table 5 Survey Tool for Achievement Motivation

NAME OF THE TEST	AUTHOR	YEAR	STATUS	REASON
Achievement Motive Test	V.P Bhargava	2009	REJECTED	This is not applicable for middle stage students.
Achievement Motive Scale	P.S.N Tiwari	1986	REJECTED	It is not fulfilling all the dimensions of this study. This is applicable for rural populations.
Achievement Motivation Scale	Pratibha Deo& Asha Mohan	2011(Revised)	Selected	It fulfils all the dimensions of this study.

13.0.0 STATISTICAL TECHNIQUES

- **Descriptive Statistics:** Mean, Standard Deviation
- **Inferential Statistics:** Analysis of Covariance (ANCOVA) will be used for comparison between control and experimental group differences by controlling covariate effect.

14.0.0 SIGNIFICANCE OF THE STUDY

The present study is significant from the following ways;

1. The present study will be significant from the point of view as it is an attempt to develop an innovative programme on art-integrated teaching of mathematics.

2. The study will be significant as it aims to find conclusive evidence by testing the effectiveness of art-integrated learning in mathematics.

3. The study will also try to explore and find out about different art-integrated learning activities that can be integrated into mathematics teaching.

4. The present study will also try to incorporate different art forms, such as performing and visual arts, into the core curricula for a better understanding of concepts. It also helps in increasing relevance through the integration of art forms and subject matter.

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